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IS 4410-22 (1994): Glossary of terms relating to river valley projects, Part 22: Barrages, weirs [WRD 22: River Training and Diversion Works]



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भारतीय मानक

नदी घाटी परियोजनाओं सम्बन्धी परिभाषिक शब्दावली

भाग 22 बैराज और वीयर

*Indian Standard*

GLOSSARY OF TERMS RELATING  
TO RIVER VALLEY PROJECTS

PART 22 BARRAGES AND WEIRS

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## **FOREWORD**

**This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee, had been approved by the River Valley Division Council.**

**A large number of Indian Standards have already been printed covering various aspects of river valley projects and some more similar standards are in the process of formulation. These standards include technical terms, and precise definitions for these are required for avoiding ambiguity in their interpretation. To achieve this aim, the Terminology Relating to River Valley Projects Sectional Committee is bringing out Indian Standard Glossary of terms relating to river valley projects ( IS 4410 ), being published in parts. This Part 22 contains definitions of terms relating to barrages and weirs.**

*Indian Standard***GLOSSARY OF TERMS RELATING  
TO RIVER VALLEY PROJECTS****PART 22 BARRAGES AND WEIRS****1 SCOPE**

This standard (Part 22) covers the definitions of terms relating to Barrages and Weirs.

**2 GENERAL TERMS**

Terminology adopted in Barrages and Weirs have the following definitions.

**2.1 Abutment**

A wall constructed at both ends of the structure mainly for effective keying the main barrage/weir structure into the ground at either end and also to perform additional functions, such as, retaining the backfill, protecting the bank from erosion, supporting load from superstructure and confining the flow to the desired waterway at the structure.

**2.2 Afflux**

The difference in water level between upstream and downstream of a barrage/weir under free flow condition, as a result of construction of the structure on the river.

**2.3 Afflux Bund**

An earthen embankment or dyke designed to ensure that the structure is not outflanked during flood flows and in some cases acting as embankment to prevent flooding of the country side due to rise in water level.

**2.4 Aggradation of Level**

An increase or rise in specific levels of the bed (the bed level at specific discharge) of a channel at any site.

**2.5 Alluvial River**

River which flows through alluvium formed from its own deposits.

**2.6 Apron**

A protective layer of stone or other material provided in the bed of the river where it is desired to prevent erosion.

**2.7 Backwater Curve**

The upstream longitudinal profile of the surface of water in a stream/river or free flow conduit from a point where such water surface is raised above its normal level by a diversion structure.

**2.8 Barrage**

A permanent barrier provided with a series of gates across the river to regulate water surface level and pattern of flow upstream and for other purposes, distinguished from a weir in that it is gated over its entire length and may or may not have a raised sill.

**2.9 Bay**

One of the main divisions of the diversion structure such as spillway, undersluice, riversluice, regulator intake, etc, in between two consecutive piers or a pier and abutment or a pier and the nearest divide wall.

**2.10 Bed Material**

Material, the practicle sizes of which are found in appreciable quantities in that part of the bed affected by transport.

**2.11 Block Outs**

Temporary recesses provided in the civil structure to facilitate proper embedment of steel fixtures for gates, trestles, etc, and which are concreted after their fixing.

**2.12 Boulder Stage of River**

The reach of river characterized by steep bed slope and a bed comprising a mixture of boulder, shingle, gravel and sand.

**2.13 Chute Blocks**

Cement concrete block provided at suitable spacing at the toe of the downstream glacis of the structure for improved energy dissipation.

**2.14 Cofferd Dam**

A temporary structure constructed to exclude water from the work site during construction.

**2.15 Concentration Factor**

The factor by which the discharge per unit length of a barrage/weir assuming uniform distribution is required to be increased for purposes of design to allow for higher concentration of discharge in some parts of the structure.

**2.16 Construction Joint**

A joint occurring in a structure composed of homogeneous material, such as earth or concrete,

along a plane or surface, formed by cessation of the placing of material for a time, such as overnight or for several days.

### **2.17 Contraction Joint**

A joint provided to localise and minimise development of cracks due to drying, shrinkage and thermal variations.

### **2.18 Crest**

The line or area defining the top of the barrage/weir.

### **2.19 Cut Offs**

Lugs either of R.C.C. masonry or of steel sheet pile, provided at the bottom of the structure to protect the structure against scours and possible piping due to excessive exit gradients of the seepage flow below the foundations.

### **2.20 Design Flood**

The maximum flood discharge in the river for which the barrage/weir waterway, scour, freeboard, etc, are to be designed.

### **2.21 Dewatering**

Lowering of the water table to facilitate construction of the barrage/weir substructure and item to be done in a fairly dry condition and to create reasonably dry condition for foundation work.

### **2.22 Differential Head**

The difference in water levels between upstream and downstream water surfaces of the structure or the difference in water levels on either side of a pier or divide walls.

### **2.23 Divide Wall**

Wall constructed usually at right angles to the axis of the barrage extending well beyond the main structure to separate the undersluice, riversluices and spillways into independent units for facilitating regulation.

### **2.24 Diversion Ratio**

The ratio of the flow diverted to the stream flow.

### **2.25 Diversion Works or Diversion Structure or Head Works**

A collective term for all works required on the river or channel to divert control or regulate the water level or water supplies in the river/channels or offtaking canals.

### **2.26 Dominant Discharge**

The discharge which is large enough in magnitude and is of sufficient frequency of occurrence to have a dominating effect in determining the size and characteristics of the river course, canals and bed.

### **2.27 Embayment**

The area within the swing of the bend of a river. Also a local recession of a river bank due to erosion, that is, a bite taken out of a river bank.

### **2.28 End Sill**

Raised sill provided at the end of the stilling basin for energy dissipation.

### **2.29 Erosion**

The lowering of land or river bed due to wearing away caused by weathering and transportation under the influence of wind or water.

### **2.30 Exit Gradient**

The upward seepage force per unit volume of seepage water through foundation soil at the tail end of a barrage/weir, tending to lift up the soil particles if it is more than the submerged weight of a unit volume of the latter. It is also defined as the hydraulic gradient of emerging stream lines at the end of an impervious apron.

### **2.31 Expansion Joint**

A type of joint provided in the structure to localise and permit longitudinal expansion and contraction when changes in temperature occur and to permit vertical movement where differential settlement is anticipated.

### **2.32 Filter**

A layer or combination of layers of graded pervious materials designed and placed in such a manner as to provide drainage and yet prevent the movement of soil particles with seepage water.

### **2.33 Fish Ladder/Lock**

Device provided in the diversion structure for the smooth passage of fish from upstream to downstream and *vice versa*.

### **2.34 Flank Walls**

Retaining wall in continuation of abutments both upstream and downstream.

### **2.35 Flared Wall**

Retaining wall with its profile gradually changing from one slope to another as required. Flared walls may be straight or curved.

### **2.36 Flexible Apron, Talus or Placed Riprap**

A protection at the downstream or upstream end of a barrage/weir, fall, etc, consisting of blocks of concrete or masonry or stones or stones in wire crates (gabions). This is also referred to as loose apron.

### **2.37 Free Board**

The vertical distance between a specified water surface and top of the component of a structure under consideration.

### **2.38 Friction Block**

Staggered R.C.C. blocks provided in the stilling basin for energy dissipation.

### 2.39 Froude Number

The dimensionless parameter expressing the ratio between inertia and gravitational forces in liquid. The number is obtained by dividing the mean velocity by the square root of the product of mean depth and the acceleration due to gravity:

$$F_r = \frac{V}{\sqrt{gd}}$$

where

$V$  = mean velocity,

$g$  = acceleration due to gravity, and

$d$  = mean total depth.

### 2.40 Gauge-Discharge Curve/Stage Discharge Curve

The curve indicating the relationship between various levels/stages of the river and corresponding river discharges at a particular river location.

### 2.41 Glacis

The sloping portion of the floor upstream and downstream of the crest.

### 2.42 Guide Bund

A protective and training embankment constructed at the side of a barrage/weir to smoothly guide the flow through the waterway.

### 2.43 Hydraulic Jump

The sudden and usually turbulent passage of water from a lower level (below critical depth) to higher level (above critical depth), during which headloss occurs and the flow passes from supercritical to sub-critical state.

### 2.44 Hydrograph

A graph showing the stage, discharge, velocity or some other features of flowing water with respect to time, at a given site.

### 2.45 Intake or Head Regulator

A structure built at the diversion structure to divert, control and regulate water supplies from the pond into the canal.

### 2.46 Lock

A structure (open rectangular chamber) built in an open conduit in a reach having a considerable vertical drop in water levels to pass two-way traffic by means of an open water chamber having movable and water tight gates at both ends. The water traffic is raised or lowered by admitting or releasing water from the chamber to negotiate with the desired water level upstream or downstream.

### 2.47 Looseness Factor

The ratio of the overall length of the barrage/weir provided to theoretically computed minimum stable width of the river at the design flood obtained by using Lacey's equation.

### 2.48 Meander

A meander in a river consists of two consecutive loops, one flowing clockwise and the other counter clockwise.

### 2.49 Operating Platform

A platform constructed on the top of piers to support the gate stand and operating mechanism.

### 2.50 Pier

Concrete or masonry structure constructed over the waterway for supporting bridge decking, gates and hoist operating mechanism.

### 2.51 Pitching

A protective covering of properly packed or built-in materials on the earthen surface/sides (side pitching) and bed (bed pitching) to protect them from the erosive action of water.

### 2.52 Pond/Pool Level

The level of relatively still water immediately upstream the barrage/weir required to facilitate withdrawal into the canals or for any other purpose.

### 2.53 Regime

The condition of a stream or channel in respect of its stability.

### 2.54 Retrogression of Level

A general decrease in the bed level of the river or channel over a sufficiently long length downstream of a structure.

### 2.55 Revetment

A protective surface of pitching, concrete blocks or mattresses placed on the bottom or banks of a river to prevent or minimize erosion.

### 2.56 Riprap

Broken stone dumped or placed on the surface and the slopes of embankments for protection against the action of flowing water, wave wash and heavy rain.

### 2.57 River Sluices

This is a set of sluices similar to the sluiceways and located in between the sluiceways and the spillway bays and separated from them by means of the divide walls. These are normally provided in large barrages, for maintaining a still pond just in front of the canal intake and at the same time maintaining the main dry weather river channel active towards the intake.



## 2.58 River Training

Works constructed on a river to guide and confine the flow to the river channel and to control and regulate the river bed configuration for effective and safe movement of floods and river sediment.

## 2.59 Scour

The removal of material from the bed of a channel by flowing water.

## 2.60 Sediment

Fragmental material transported in suspension or transported and deposited at another location by stream flow, regardless of its size.

## 2.61 Seepage

A slow movement of water due to capillary action through pores and interstices of unsaturated close soil material into or out of a surface or subsurface body of water such as river, canal, etc.

## 2.62 Sheet Pile

A long straight stiff structural element, usually made of steel driven in the ground under the barrage/weir floor, mainly to control underseepage and exit gradient and also to provide protection against scour.

## 2.63 Silt

A fine grained soil with little or no plasticity.

## 2.64 Silt Factor

A factor ' $f$ ' in the Lacey's regime formula and is given by the following equation in regime channels :

$$f = 1.76 \sqrt{M_r}$$

where

$M$  = average particle diameter in mm.

## 2.65 Sediment Excluder

A device by which silt is precluded from entering the canal, consisting usually of a series of R.C.C. tunnels located in front of the intake/head regulator and at right angles to the axis of the barrage.

## 2.66 Sluiceways

Sluiceways are a set of bays of the barrage at the canal end to maintain a well defined river channel towards the intake and scour out the silt/sediment deposited in front of it.

## 2.67 Spillway

This is the set of central bays in a barrage, whose crests are a little higher than those of the sluiceways and the river sluices. The spillway bays are normally operated, when the river flow exceeds the normal discharges through the sluiceways and the canal intake.

## 2.68 Specific Energy

It is the energy of stream flow per unit weight at any section of a channel measured with respect to the channel bottom as datum, namely, vertical depth plus velocity head corresponding to the mean velocity.

## 2.69 Stilling Basin

A short length of paved channel in the exit course of an outlet structure or below a spillway undersluice/ riversluice, in which part of the energy of the flowing water is dissipated and water is discharged into the downstream channel in such a manner as to prevent damage to the structure from dangerous scour of bed or banks of the channel.

## 2.70 Stone Reserve

A quantity of stone kept as reserve on guide bunds, spurs or groynes for emergency use, to prevent deep scour occurring and endangering the safety of the structure.

## 2.71 Stone Mesh

A type of construction in which shingle, small boulders, or other form of stone, is held together by a wrapping of wire mesh, to give a heavy but more or less flexible structure used in various forms as groynes, aprons, low weirs, etc. Rounded stone is usually preferred to increase flexibility.

## 2.72 Stoplogs

Fabricated structural steel or wooden units utilised for temporary closure of any bay, in order to facilitate repairs of the gate and other components of the bay.

## 2.73 Sub-Critical Flow

The flow in which the Froude number is less than unity and surface disturbances can travel upstream.

## 2.74 Super Critical Flow

The flow in which the Froude number is greater than unity and surface disturbances will not travel upstream.

## 2.75 Toe Protection

Loose stones wire crates or concrete blocks laid or dumped at the toe of an embankment, groyne, etc, or masonry or concrete wall built at the junction of the slope of pitching and the bed in channels or at extremities of hydraulic structures to counteract erosion.

## 2.76 Toe Wall

A shallow wall constructed below the bed or floor level to provide a foothold for the sloped pitching or the facing of an embankment.

## 2.77 Trash Rack

Metallic racks in front of a intake/head regulator to screen out floating materials, debris, etc.

### **2.78 Unit Hydrograph**

Hydrograph of storm run-off at a given point on a given stream, which will result from an isolated rainfall excess of unit duration, occurring over the contributing drainage area and resulting in a unit depth of run-off.

### **2.79 Uplift**

The vertical upward pressure caused by the water seeping through the pores, cracks and fissures of the foundation material.

### **2.80 Velocity of Approach**

A mean velocity in the stream immediately upstream of a barrage/weir.

### **2.81 Waterway**

The sectional area or the amount of opening (vent)

provided for flow of water through barrages/weirs, head regulators, etc.

### **2.82 Weep Holes**

Opening left in walls, aprons linings, foundations, etc, to permit drainage and reduce pressure.

### **2.83 Weir**

A solid barrier across a river/stream water course to raise the water level for diversion purposes.

### **2.84 Wing Walls**

Walls joining the abutment of a structure to earth dyke or the banks to retain and protect the earth fill behind and provide a longer path of percolation around the end of a structure or for improving the flow conditions upstream and downstream of the controlling section.

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## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha  
( Common to all Offices )

### Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

Telephone

{ 331 01 31  
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
{ 37 86 26, 37 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43  
{ 60 20 25

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
{ 235 13 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri ( East )  
BOMBAY 400093

{ 632 92 95, 632 78 58  
{ 632 78 91, 632 78 92

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